C-AD

RHIC Retreat 2006

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1. Power Dips

   Typical Dips

   Response of Equipment

   Emergency Power Systems

   STAR Power Supply Failures

2. Response to 1006 Arc Flash

3. 1004 B CB Problem

4. AMMPS Transformer Replacement

Power Dips

Power Dips
(Internal / External)

Number of power dips.
Dates: 4/14, 5/29, 5/30, 6/4, 6/10, 6/23, 6/24 and 6/25

Nature of power dip:
Usually 15~20%, 6 to 10 cycles.

Power Dips

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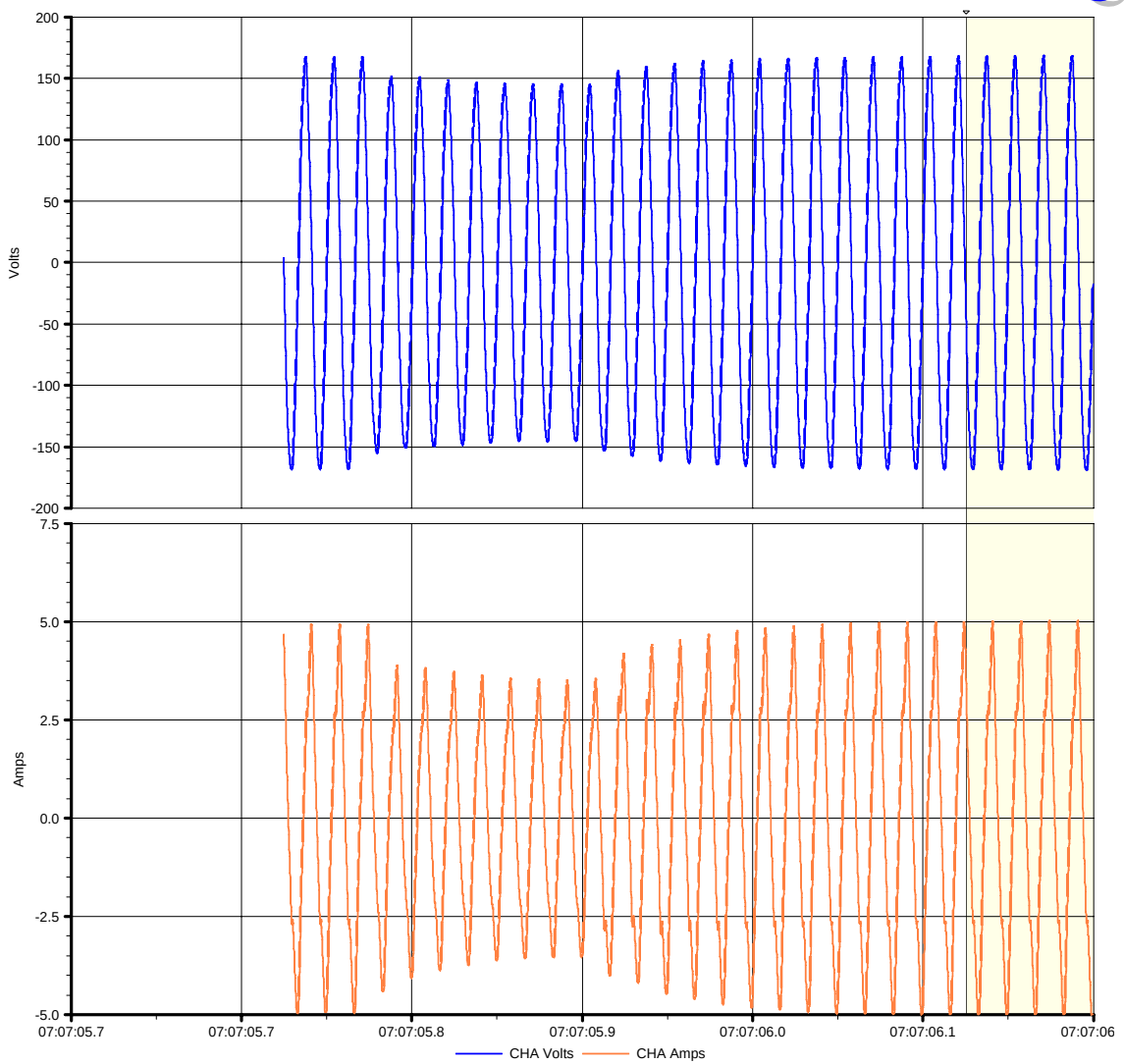
17 % dip

10 cycles



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Power Dips

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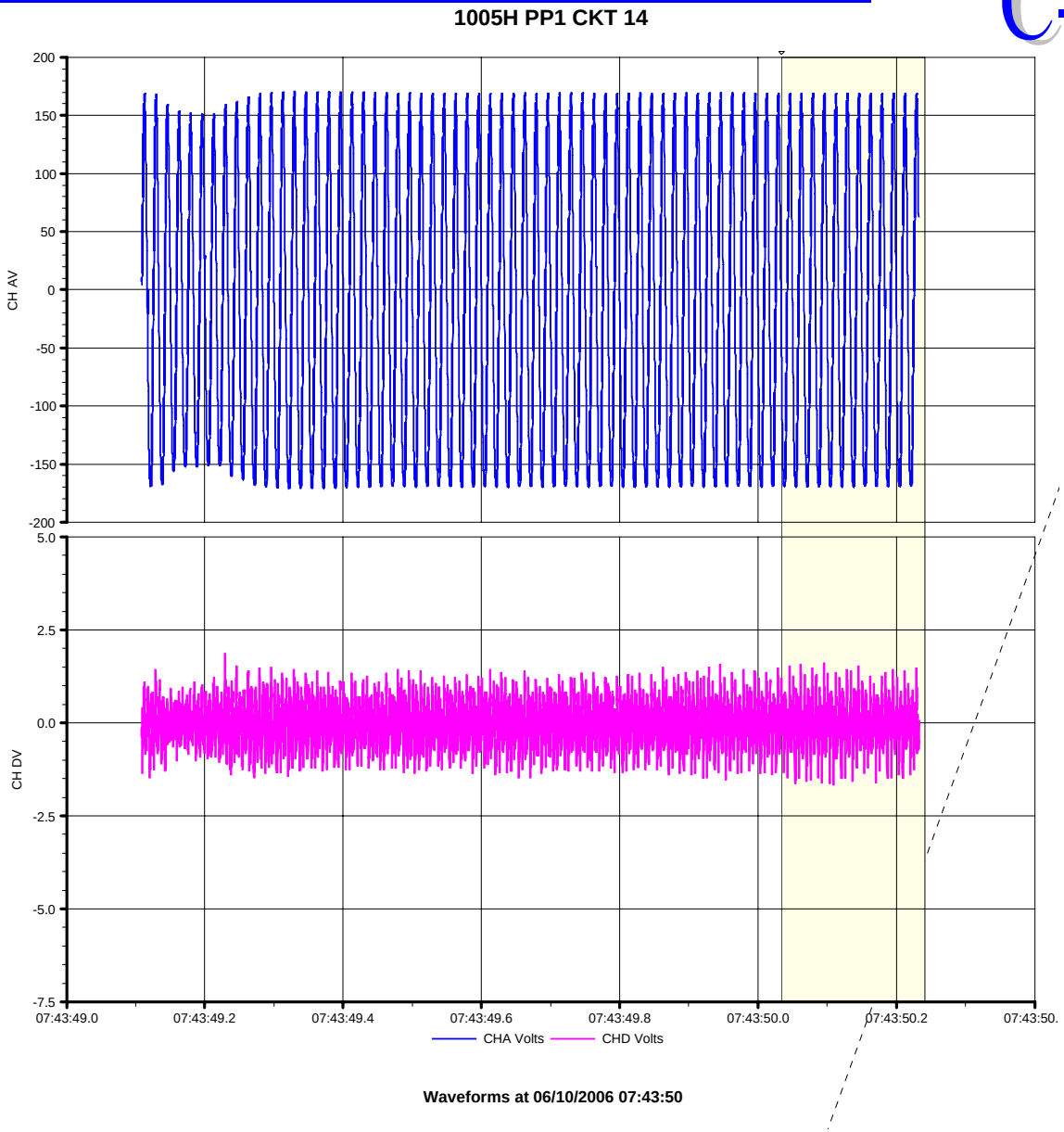
11.7 % dip

9 cycles



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Power Dips

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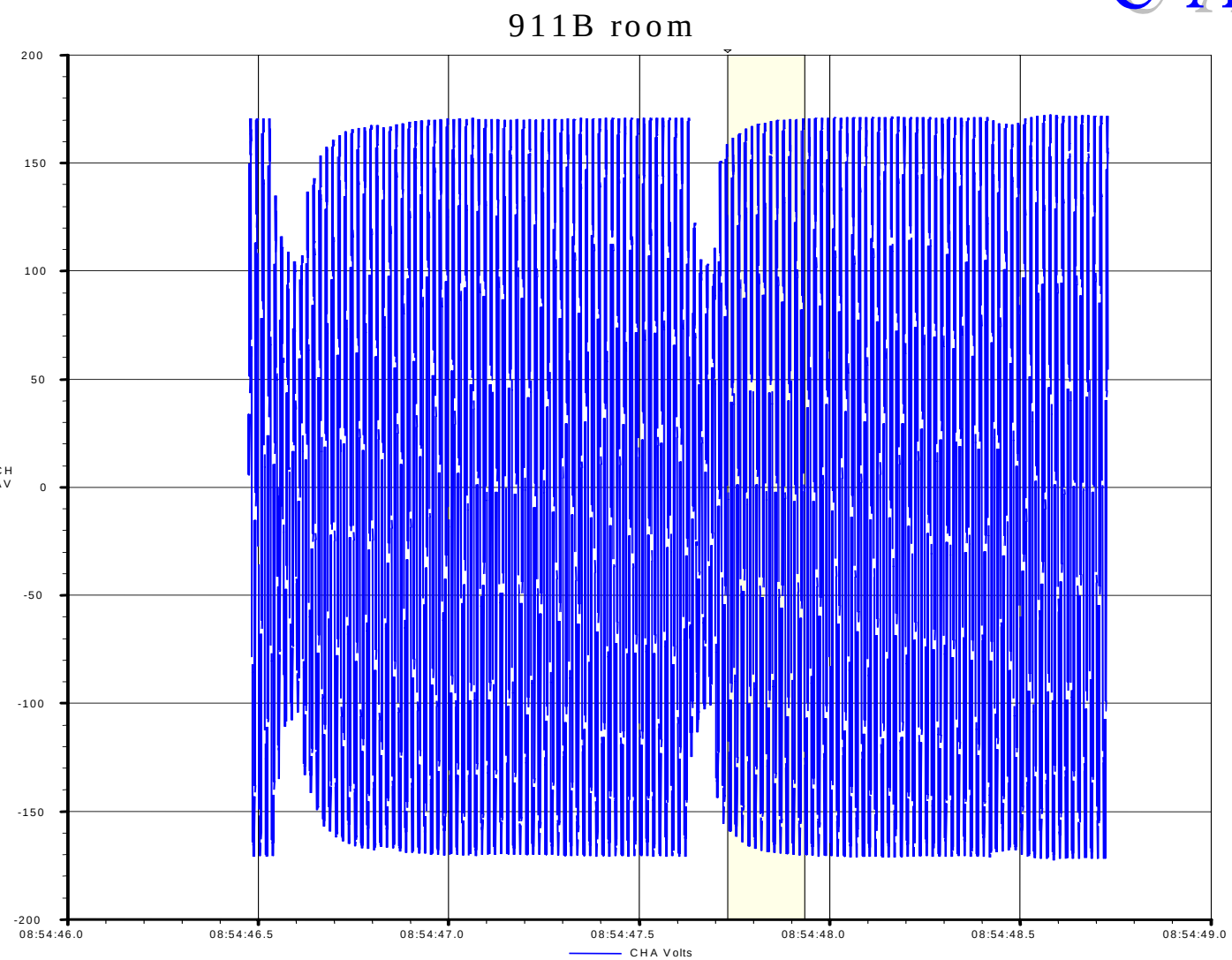

35 % dip

10 cycles

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Effects

1. Power Supply or Equipment Failure
2. Under Voltage Settings
3. Controls Upset

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- Study the Powerfail Modules On VME Crates
  - Add UPS power to the Alcoves
  - Put Network Switches on UPSs
- Study the sensitivity of Rotator and Snake Power supplies to power quality
- Investigate the Under Voltages trip settings on Power supplies

UPS

Number of UPS:

AGS: 21 units. 6 kVA, 15 kVA and 30 kVA.

RHIC: 27 units. 6 kVA, 10 kVA and 15 kVA.

Typically the UPS can supply power
for 10-15 minutes

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Summer Projects

SSecurity CYBEREX UPS tie-in
9911B UPS1 and UPS2 upgrade to 30 kVA
AAlcove UPS, under consideration
((Thirty Six 3 kVA UPSs-Material Costs $72K)

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Diesel Generators

- C-AD has eight diesel generators at RHIC complex and four diesel generators at 912A

- Two of the four diesel generators are out of service due to shortage of the parts.

- The total AGS complex demand emergency load is 1123 kVA

- The B912A generators are maintained routinely and run with the load banks once every month, but not started with the ATS

- The RHIC generators are maintained and load tested once every two month. Load testing began 2005

- A $500K budget for the upgrade of the B912 generators was approved.

- The budget includes two 400 kW generators and three automatic transfer switches (ATS).

- The second phase of the project will provide a third generator and three transfer switches.

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ATS

- AGS: 16 units.
- RHIC: 8 units.
- Project:
- Upgrade 928 ATS from 200A to 400A. The new switch has been delivered.

STAR Detector PS Problems

- A Hard crash of the Main Solenoid power supply would typically blow fuses in the power supply filter section.
- A hard crash of the Main Solenoid PS would typically blow fuses in the Space Trim SCR Bridges
- A Faulty Fiber optic cable / sender was found in the Main SCR triggering circuit

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Response to 1006 Arc Flash

1006 Fuse Disconnect Switches Failure

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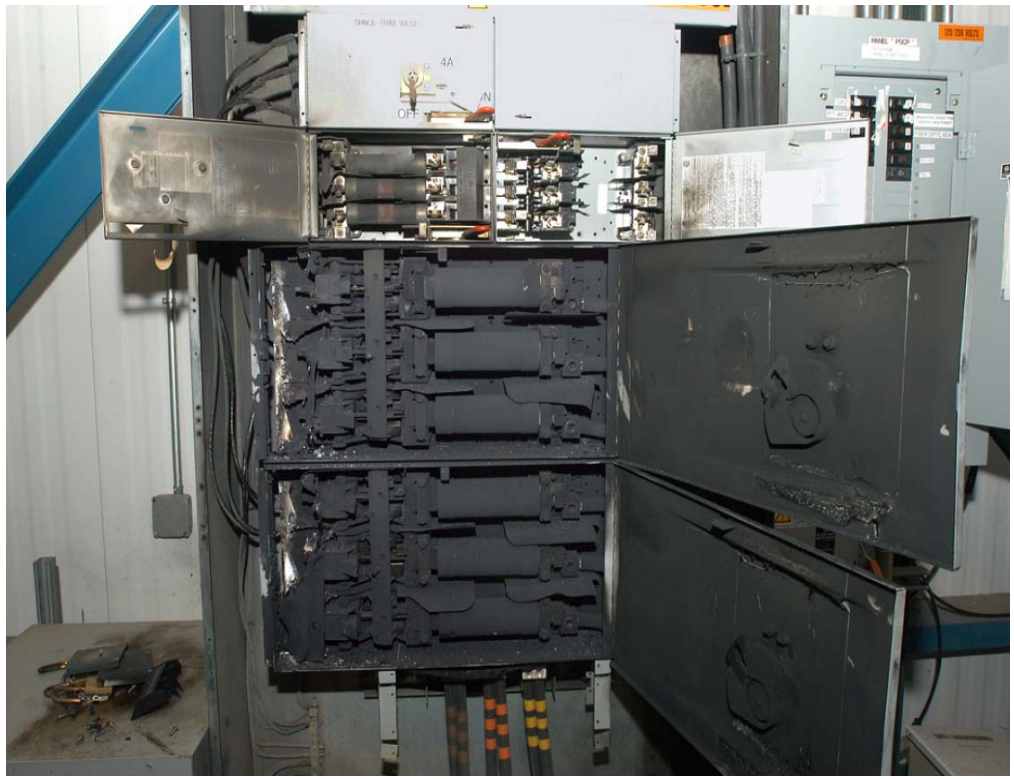
Findings



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Possible Causes for Arc Flash

- High transient voltage

– Arcing ground fault on ungrounded delta system

- Foreign object

– Open conduit stub may be source of foreign object

- Switch Failure (after examination of switches)

Accident Prevention Recommendations

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- Activate/install ground fault detection systems
- Install systems to minimize voltage transients
- Implement a project plan for energy calculations
- Review other practices:
  - Racking circuit breakers with bus energized
  - Inserting/removing motor control center starter-buckets while energized

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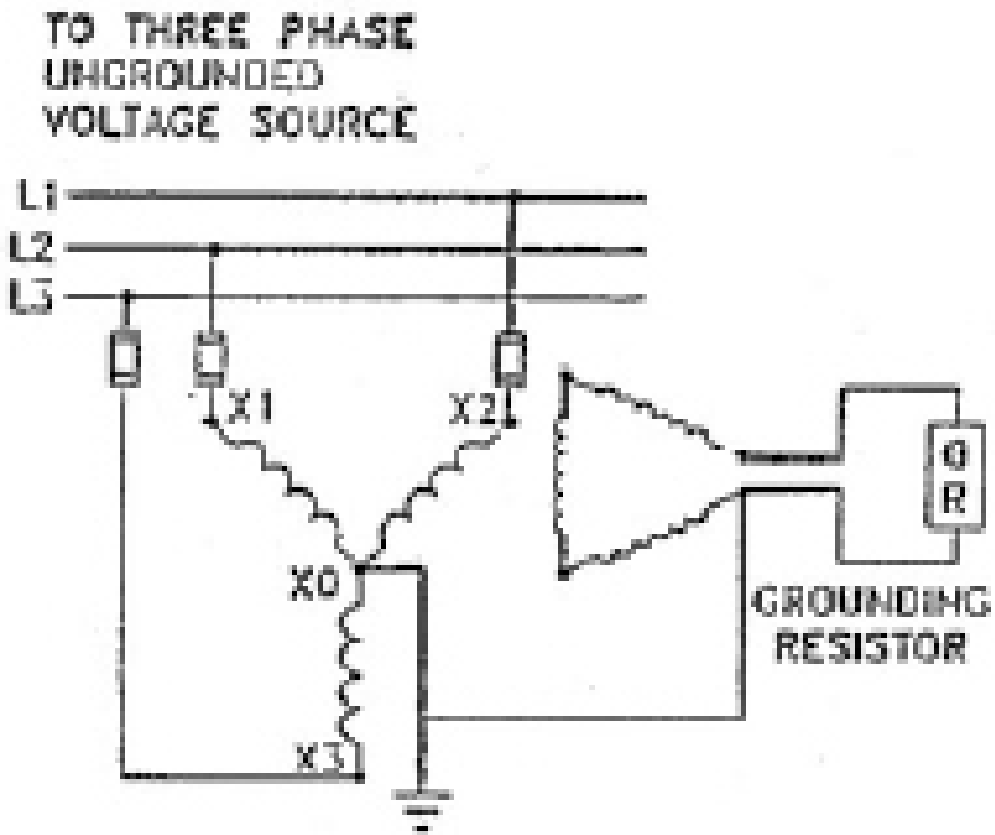
Summer Projects

Ground fault monitoring

- Complete the remote monitoring and alarming of 18 substations

- Reviewing the possibility of a 480V high resistance ground system.

- Measuring the substation charging currents to determine whether the existing PTs can support an appropriate burden resistance


TO THREE PHASE
UNGROUNDED
VOLTAGE SOURCE
L1
L2
L3
X1
X2
X0
X3
G
R
GROUNDING
RESISTOR

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Summer Projects

Replace GE SPECTRA series Power Panelboards

SSTAR PB-1 panelboard with motorized main breaker
RReplace nine priority “1” and “2” power panelboards.
IInspect and maintain other 15 power panelboards

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- Summer Projects

Building 1004B GE AKR breaker reconditioning

Incident Energy Calculations

Updating One Line Diagrams

Proper Labeling of Panels

AMMPS Transformer Replacement

Siemens PS Block Diagram

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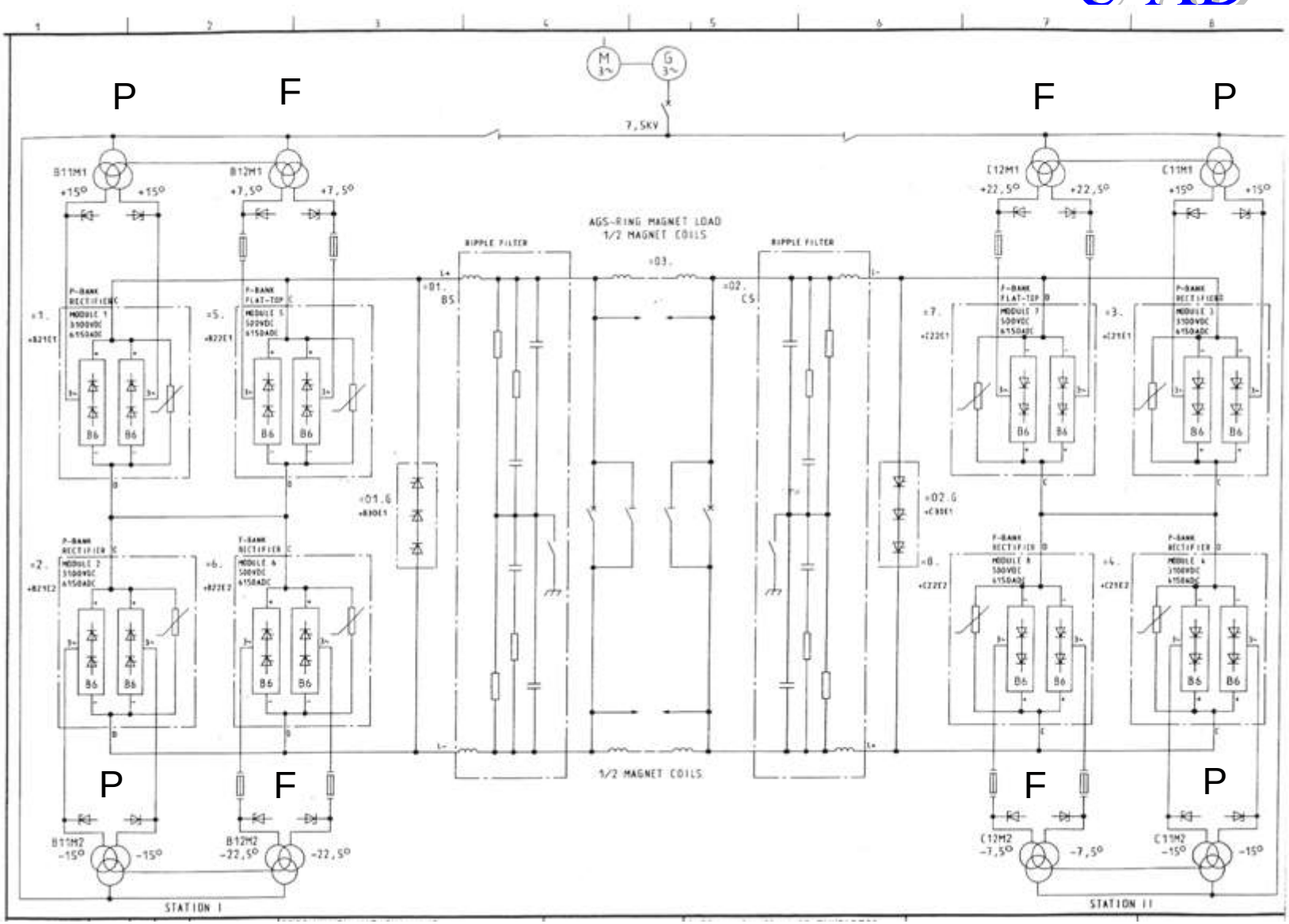

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Siemens Transformer Yard

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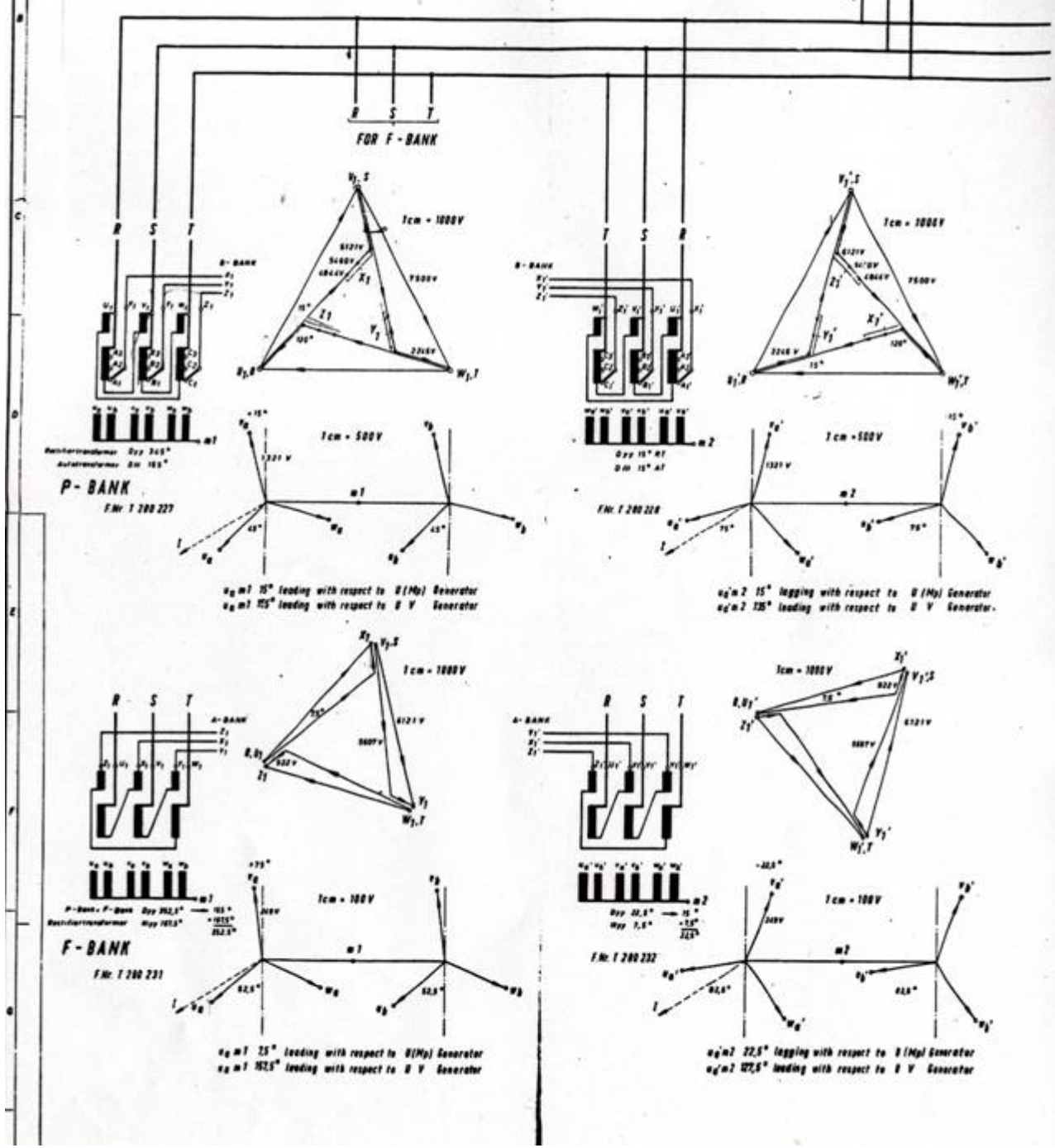
Phasor Diagram of ½ the present Transformer Configuration



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F to P filtered Front Porch Total Voltage

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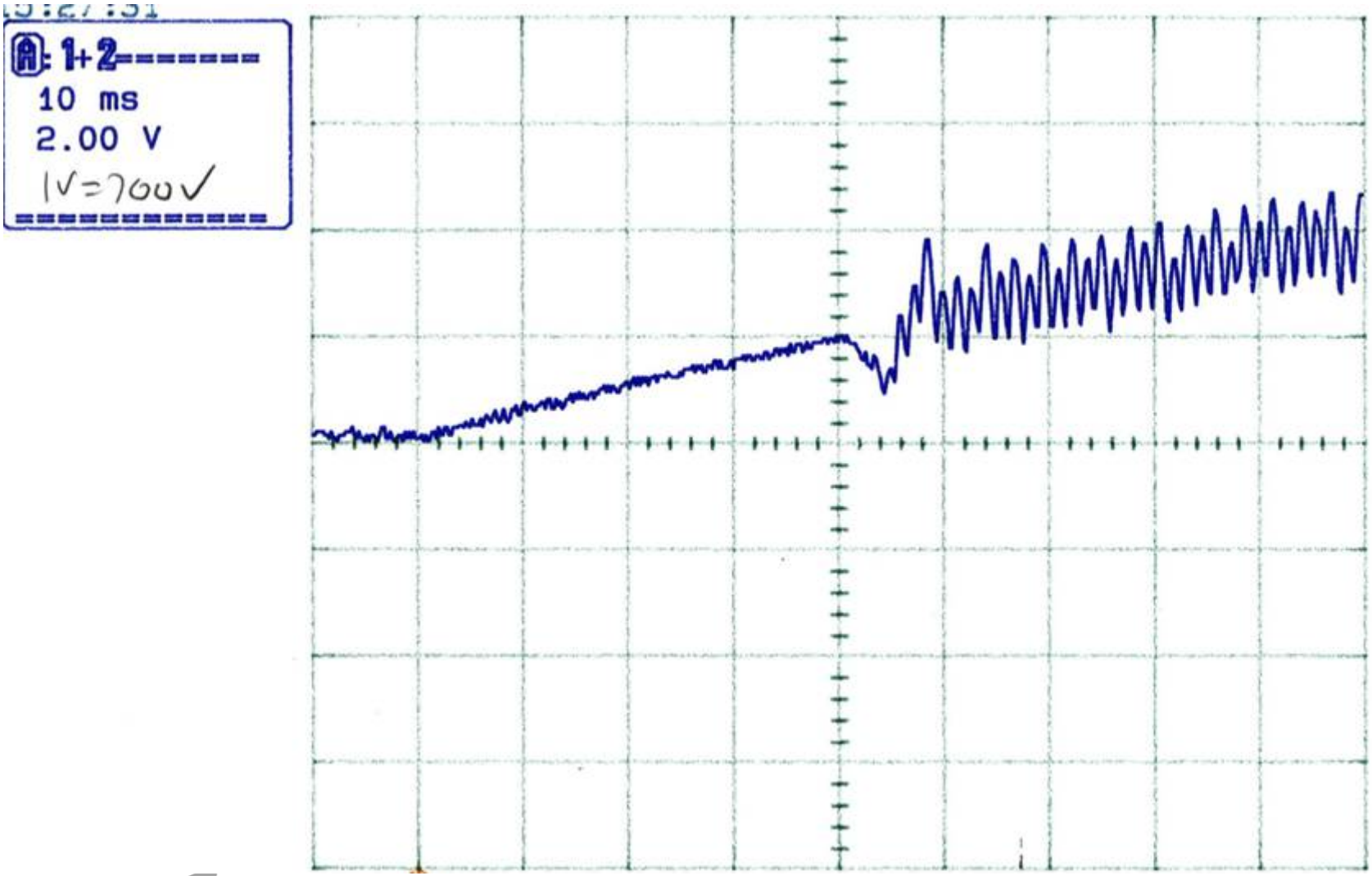

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